

## CLAIMS

1. An apparatus for increasing the flow of blood in a patient, the apparatus comprising:

(a) a base contoured to seat near a central region of the patient's chest;

5 (b) a manual actuator;

(c) a substantially inelastic belt for wrapping around the chest; and

(d) a force converter mounted on the base, connected to the actuator and having belt connectors for connecting to opposite first and second extremities of the belt, for converting a force manually applied to the actuator and directed toward the chest into a chest compressing resultant directed through the base toward the chest and belt tightening resultants applied to the belt connectors directed tangential to the chest.

2. An apparatus in accordance with claim 1, wherein the

manual actuator comprises first and second hand grippable handles.

3. An apparatus in accordance with claim 2, wherein the  
5 converter comprises:

(a) a first arm having a handle end to which the first handle is mounted and having an opposite, belt end to which a first extremity of the belt is attached, said first arm being pivotally mounted to the base at a first arm fulcrum intermediate the handle end and the belt end; and

10 (b) a second arm having a handle end to which the second handle is mounted and having an opposite, belt end to which a second extremity of the belt is attached, said second arm pivotally mounted to the base at a second arm fulcrum intermediate the handle end and the belt end.

15 4. An apparatus in accordance with claim 2, wherein the converter comprises:

(a) a first assembly having a pair of spaced, parallel arms rigidly connected at handle ends by the first handle, the arms rigidly connected at opposite, belt ends by a first strut, and the arms pivotally mounted to the base at a first assembly fulcrum intermediate the handle and belt ends; and

25 (b) a second assembly having a pair of spaced,

parallel arms rigidly connected at handle ends by the second handle, the arms rigidly connected at opposite, belt ends by a second strut, and the arms pivotally mounted to the base at a second assembly fulcrum intermediate the 5 handle and belt ends.

5. An apparatus in accordance with claim 4, wherein one of the arms of the first assembly pair and one of the arms of the second assembly pair are mounted to a side of the 10 base, and the other arm of the first assembly pair and the other arm of the second assembly pair are mounted to an opposite side of the base.

6. An apparatus in accordance with claim 5, wherein the 15 assembly fulcrums coincide at a pivot pin extending through all the arms of the assemblies and through the base.

7. An apparatus in accordance with claim 6, wherein the belt ends and the handle ends of the arms have longitudinal 20 axes, and the belt end axis of each arm is transverse to the handle end axis of the same arm.

8. An apparatus in accordance with claim 7, wherein an angle of about  $120^\circ$  is formed between the belt end axis of 25 each arm and the handle end axis of the same arm.

9. An apparatus in accordance with claim 4, wherein the first belt extremity is conformed to attach to the belt end of at least one arm of each assembly and the second belt extremity is conformed to attach to the belt end of at least one arm of each assembly.

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10. An apparatus in accordance with claim 4, wherein the first belt extremity is conformed to attach to the first strut, the second belt extremity is conformed to attach to the second strut.

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11. An apparatus in accordance with claim 10, further comprising fasteners mounted to the extremities of the belt.

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12. An apparatus in accordance with claim 11, wherein the fasteners comprise hooks and loops material.

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13. An apparatus in accordance with claim 11, further comprising indicia imprinted on a surface of the belt corresponding to a length of each belt extremity.

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14. An apparatus in accordance with claim 13, wherein the indicia are colored bands oriented transverse to a longitudinal axis of the belt.

15. An apparatus in accordance with claim 5, wherein a pair of stroke limiting bars is pivotally mounted to the pair of arms of the first assembly, between the fulcrums and the handle ends of each of the arms, extending to  
5 sliding attachment with the pair of arms of the second assembly, each of said stroke limiting bars extending between arms mounted to the same end of the base for limiting the relative displacement of the attached arms.

10 16. An apparatus in accordance with claim 15, wherein the stroke limiting bars are adjustably, slidably attached to the pair of arms of the second assembly, for adjusting stroke limitation.

15 17. An apparatus in accordance with claim 4, further comprising a rigid, substantially planar backboard to which the belt is attached.

20 18. An apparatus in accordance with claim 17, wherein the backboard has two spaced, parallel slots through which the belt extends.

25 19. An apparatus in accordance with claim 18, wherein the backboard has a raised portion, integral with a planar portion, conformed to receive and support a patient's neck

above the planar portion.

20. An apparatus in accordance with claim 19, further comprising a pressurized gas container, hose and breathing mask housed within the backboard, beneath the raised portion.

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10 21. An apparatus in accordance with claim 20, further comprising a force sensor on a chest contacting surface of the base, and a force indicator mounted to the base.

22. An apparatus in accordance with claim 21, further comprising a signal generator, mounted to the base, for producing periodic signals.

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23. A method of treating patients comprising:  
(a) seating a base of a blood flow increasing apparatus on a patient's chest near a central region of the chest;  
20 (b) wrapping a belt around the patient's chest;  
(c) fastening first and second opposite extremities of the belt to the apparatus;  
(d) applying a force, directed toward the chest, to a manual actuator mounted to a converter, said converter 25 connected to the base and the belt, configured to convert

the force into a chest compressing resultant directed toward the chest and belt tightening resultants directed tangentially to the chest.

5       24. A method in accordance with claim 23, wherein applying the force further comprises grasping a pair of hand grippable handles and applying a force having a component directed toward the chest.

10      25. An apparatus for increasing the flow of blood in a patient, the apparatus comprising:

      (a) a base configured to seat near a central region of a patient's chest;

      (b) an actuator;

15      (c) a substantially inelastic belt configured to wrap around the chest; and

      (d) a force converter mounted on the base, connected to the actuator and having belt connectors for connecting to opposite extremities of the belt, for converting a force applied by the actuator into a chest compressing resultant directed toward the chest and belt tightening resultants directed tangentially to the chest.

26. An apparatus in accordance with claim 25, wherein the

25 actuator comprises a prime mover.

27. An apparatus in accordance with claim 26, wherein the force converter comprises:

(a) a first arm having a handle end and an opposite, belt end to which a first extremity of the belt is attached, said first arm being pivotally mounted to the base at a first arm fulcrum intermediate the handle end and the belt end; and

(b) a second arm having a handle end to which the second handle is mounted and having an opposite, second belt extremity to which a second end of the belt is attached, said second arm pivotally mounted to the base at a second arm fulcrum intermediate the handle end and the belt end.

15 28. An apparatus in accordance with claim 26, wherein the converting means comprises:

(a) a first assembly having a pair of spaced, parallel arms rigidly connected at handle ends by the first handle, the arms rigidly connected at opposite, belt ends by a first strut, and the arms pivotally mounted to the base at a first assembly fulcrum intermediate the handle and belt ends; and

(b) a second assembly having a pair of spaced, parallel arms rigidly connected at handle ends by the second handle, the arms rigidly connected at opposite, belt

ends by a second strut, and the arms pivotally mounted to the base at a second assembly fulcrum intermediate the handle and belt ends.

5       29. An apparatus in accordance with claim 28, wherein one of the arms of the first assembly pair and one of the arms of the second assembly pair are mounted to a side of the base, and the other arm of the first assembly pair and the other arm of the second assembly pair are mounted to an  
10       opposite side of the base.

30. An apparatus in accordance with claim 29, wherein the assembly fulcrums coincide at a pivot pin extending through all the arms of the assemblies and through the base.

15       31. An apparatus in accordance with claim 6, wherein the arms are curved.

20       32. An apparatus in accordance with claim 5, further comprising at least one pair of facing shoulders formed on a pair of opposing arms, one shoulder formed on each arm, to form a gap between the facing shoulders into which a stop pin extends, for limiting the relative displacement of the opposing arms.

33. An apparatus in accordance with claim 5, further comprising:

(a) three shoulders formed on each of two opposing arms, forming three gaps of different length between three pairs of facing shoulders;

(b) an upright mounted to the base and having three holes formed through the upright, each hole corresponding to one gap; and

(c) a stop pin extending from insertion in one of the holes into one of the gaps, for adjustably limiting the relative displacement of the opposing arms.

34. An apparatus in accordance with claim 4, further comprising a means mounted on a chest-contacting surface of the base for adhering the chest-contacting surface of the base to the chest.

35. An apparatus in accordance with claim 34, wherein the means for adhering comprises a suction cup.

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36. An apparatus in accordance with claim 34, wherein the means for adhering comprises an adhesive.

37. An apparatus in accordance with claim 1, further comprising a pair of spaced electrodes mounted to the

apparatus for contacting two spaced outer chest surfaces.

38. An apparatus in accordance with claim 37, wherein a first electrode is mounted to a base outer, chest-contacting surface, and a second electrode is mounted to an apparatus chest-contacting surface which is spaced from the first electrode.

39. An apparatus in accordance with claim 38, wherein the second electrode is mounted to the belt.

40. An apparatus in accordance with claim 39 further comprising a plurality of electrodes interposed along a belt longitudinal axis.